

PATENT ABSTRACTS OF JAPAN

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(54) HIGHLY RELIABLE RADIO RECEIVER

(57)Abstract:

PROBLEM TO BE SOLVED: To surely switch a standby system and to monitor a 2nd reception low-noise amplifier (RA) in the standby system in the case occurring a fault in a 1st (RA) or its cooling means.

SOLUTION: A pilot signal, having a frequency within an attenuation band of 1st and 2nd reception hand filters 4, 14, is inputted from a pilot signal generating means 21 to 1st and 2nd RAs, each output is taken out from 1st and 2nd distribution means 24, 25 and each level is detected by using 1st and 2nd level detection means 26, 27. A

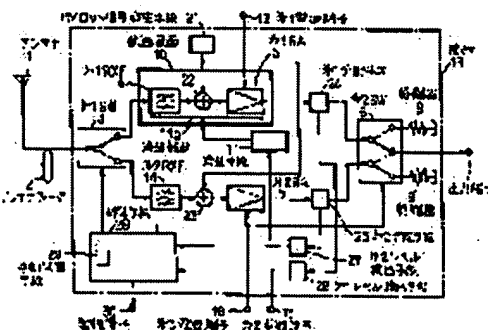
control means 28 switches 1st and 2nd signal

changeover means (SW) 3, 6, when each detection level

is below a threshold and transmits a 1st or 2nd alarm

signal. A manual changeover means for the 1st and 2nd

signal changeover means is provided in the control means 28. Furthermore, the 1st reception band filter 4 is composed of a superconducting material and is made into a superconducting state by a cooling means 11.



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CLAIMS

[Claim(s)]

[Claim 1] An antenna, an antenna feeder, and the 1st signal change means that the signal from the antenna feeder is inputted and is changed by the control signal, The 1st receiving band-pass filter connected to one side of the 1st signal change means, The 1st receiving low noise amplifier connected to the 1st receiving band-pass filter, and the 2nd signal change means which is formed in the output side of the 1st receiving low noise amplifier, and is changed by the control signal, The 2nd receiving band-pass filter connected to the output terminal which outputs the output signal from the 2nd signal change means, and another connection terminal of the above-mentioned 1st signal change means, It has the 2nd receiving low noise amplifier which was connected to the 2nd receiving band-pass filter, and was connected to another connection terminal of the above-mentioned 2nd signal change means. The above-mentioned 1st receiving band-pass filter and the above-mentioned 1st receiving low noise amplifier are enclosed with a thermal shield box, and are cooled by the cooling means. In the high reliance radio set with which operating power is supplied to the above-mentioned 1st receiving low noise amplifier, a cooling means, and the 2nd receiving low noise amplifier through the 1st, 2nd, and 3rd power supply terminals, respectively A pilot signal generation means to generate the pilot signal which has a frequency in the attenuation band of the above-mentioned 1st and 2nd receiving band-pass filter, The 1st pilot signal impregnation means inserted in the path between the above-mentioned 1st receiving band-pass filter and the above-mentioned 1st receiving low noise amplifier, The 2nd pilot signal impregnation means inserted in the path between the above-mentioned 2nd receiving band-pass filter and the above-mentioned 2nd receiving low noise amplifier, The 1st distribution means which is between the output side of the above-mentioned 1st receiving low noise amplifier, and the above-mentioned 2nd signal change means, and was inserted in the outside of the above-mentioned thermal shield box, The output side of the above-mentioned 2nd receiving low noise amplifier, and the 2nd distribution means inserted between the above-mentioned 2nd signal change means, A 1st level detection means to detect the level of the above-mentioned pilot signal from the signal distributed from the above-mentioned 1st distribution means, A 2nd level detection means to detect the level of the above-mentioned pilot signal from the signal distributed from the above-mentioned 2nd distribution means, The level of the above-mentioned pilot signal detected by the above-mentioned 1st level detection means is compared with the threshold set up beforehand. When the level of the above-mentioned pilot signal is lower than the above-mentioned threshold, while changing the above-mentioned 1st and 2nd signal change means, the 1st alarm signal is sent out. Moreover, the control means which compares the level and the above-mentioned threshold of the above-mentioned pilot signal which were detected by the above-mentioned 2nd level detection means, and sends out the 2nd alarm signal when the level of the above-mentioned pilot signal is lower than the above-mentioned threshold, It is the high reliance radio set characterized by providing the manual change means which changes manually the above-mentioned 1st and 2nd signal change means formed in the above-mentioned control means, and for the above-mentioned 1st receiving band-pass filter consisting of superconducting materials, and considering as the superconducting state with the above-mentioned cooling means.

[Claim 2] The high reliance radio set characterized by supplying the power which prepares a common power supply terminal instead of the 1st and 3rd power supply terminals of the above, and is supplied from the common power supply terminal in claim 1 with a power distribution means to the above-mentioned 1st and 2nd receiving low noise amplifier.

[Claim 3] The high reliance radio set characterized by deleting the 2nd power supply terminal of the above, and supplying operating power also to the above-mentioned cooling means from the above-mentioned power distribution means in claim 2.

[Claim 4] The high reliance radio set carry out that a power stabilization means the 1st and 3rd power supply terminals of the above are deleted, is inserted in claim 1 between the above-mentioned 2nd signal change means and the above-mentioned output terminal, stabilizes the power separated with the power separation filter which separates the operating power supplied through the above-mentioned output terminal from the input signal of a RF, and the above-mentioned power separation filter, and supply the above-mentioned 1st and 2nd receiving low noise amplifier is established as the description.

[Claim 5] The high reliance radio set characterized by deleting the 2nd power supply terminal of the above, and supplying operating power also to the above-mentioned cooling means from the above-mentioned power stabilization means in claim 4.

[Claim 6] It is the high reliance radio set characterized by to send out the 3rd alarm signal while changing the above-mentioned 1st and 2nd signal change means, when it is beyond the temperature as which it set they to be [any / claim 1 thru/or / of 5], a temperature detection means detected the temperature in the above-mentioned thermal shield box was established, the above-mentioned control means acquired the temperature information in the above-mentioned thermal shield box with the above-mentioned temperature detection means, and the temperature information was determined beforehand.

[Claim 7] It is the high reliance radio set characterized by the above-mentioned temperature detection means detecting the temperature of the cooling member of the above-mentioned 1st receiving band-pass filter in the above-mentioned thermal shield box, the 1st receiving low noise amplifier, or a cooling means in claim 6.

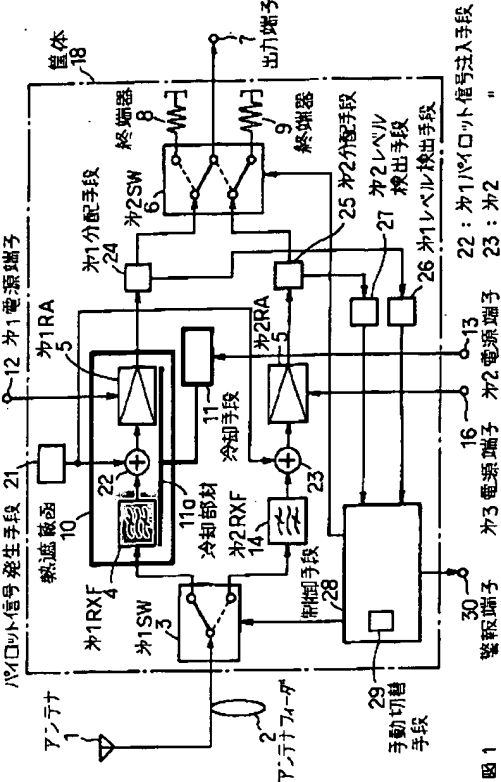
[Claim 8] The high reliance radio set characterized by establishing a 3rd signal change means to change the signal from the above-mentioned 1st and 2nd distribution means, and to supply a level detection means common to the above in claim 1 thru/or which high reliance radio set of 7 while establishing a common level detection means instead of the above-mentioned 1st and 2nd level detection means.

[Claim 9] It is the high reliance radio set characterized by the above-mentioned superconducting material consisting of high-temperature superconductors in claim 1 thru/or which high reliance radio set of 7.

[Claim 10] The high reliance radio set characterized by omitting the above-mentioned antenna feeder and linking the above-mentioned antenna with an equipment case directly in claim 1 thru/or which high reliance radio set of 7.

[Translation done.]

Drawing selection Representative drawing



[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is applied to base station receiving sets, such as mobile communication and satellite communication, cools a RF receive section, and relates to the high reliance radio set which receives a desired signal.

[0002]

[Description of the Prior Art] The basic configuration of the conventional high reliance radio set is shown in drawing 10. The antenna feeder 2 for this conventional high reliance radio set to transmit the signal received with the antenna 1 and the antenna 1, The 1st change means (SW) 3 which changes the output of an antenna 2, and the 1st receiving band-pass filter 4 which was connected to one side of 1st SW3 and which chooses the signal of a desired band (RXF), the -- one -- RXF -- four -- an output -- a request -- level -- up to -- low -- a noise -- amplifying -- the -- one -- reception -- a low noise amplifier -- (-- RA --) -- five -- the -- one -- RA -- five -- an output signal -- one side -- an input -- an edge -- inputting -- having -- the -- two -- a change -- a means -- (-- SW --) -- six -- the -- two -- SW -- six -- outputting -- having -- a signal -- outputting -- a sake -- an output terminal -- seven -- having -- ****. Termination of the terminal which is not connected with an output terminal 7 among the terminals of 2nd SW6 is carried out with the termination vessels 8 and 9.

[0003] 1st RXF4 and 1st RA5 are cooled by the cooling means 11 while being enclosed with the thermal shield box 10 and insulated with the exterior. Furthermore, the 2nd power supply terminal 13 for supplying power to the 1st power supply terminal 12 and cooling means 11 for supplying power to 1st RA5 is formed, respectively. Although it is not illustrating here, in order to take adjustment between 1st RXF4 and 1st RA5, an isolator may be formed among both.

[0004] moreover -- the -- one -- SW -- three -- another side -- a terminal -- connecting -- having had -- the -- two -- reception -- a band-pass filter (RXF) -- 14 -- the -- two -- RXF -- 14 -- an output signal -- a request -- level -- up to -- amplifying -- the -- two -- reception -- a low noise amplifier -- (-- RA --) -- 15 -- preparing -- having -- the -- two -- RA -- 15 -- an output signal -- the -- two -- SW -- six -- another side -- an input terminal -- inputting -- having. Here, the frequency band of 2nd RXF14 and 2nd RA15 is the same as that of them of 1st RXF4 and 1st RA5. Power is supplied to 2nd RA15 through the 3rd power supply terminal 16, and 1st SW3 and 2nd SW6 are simultaneously changed to the location of a continuous line or a dotted line by the control signal inputted through the control terminal 17. Usually, 1st SW3 and 2nd SW6 are connected like a continuous line. Moreover, 1st SW3, the thermal shield box 10, the cooling means 11, 2nd SW6, 2nd above-mentioned RXF14, and 2nd above-mentioned RA15 are contained by the case 18.

[0005] 1st RXF4 and 1st RA5 are enclosed with the thermal shield boxes 10, such as a Dewar vessel, by cooling member 11a of the cooling means 11, carry out long duration stability and are cooled by the very low temperature about of number 10K. The cooling means 11 consists of very-low-temperature refrigerators using the heat exchange cycle by compression and expansion of gaseous helium, and these can use a commercial product here.

[0006] Thus, while reducing in limit the thermal noise generated in 1st RXF4 and 1st RA5 by being stabilized for a long time and cooling 1st RXF4 and 1st RA5 in limit, since there are few lost parts and they end for low temperature even if it increases the number of stages which constitutes 1st RXF4, a damping property can be made steep. Consequently, the reception output of the C/N ratio (carrier power / noise power) specified, for example can be obtained also to the input signal of low level by using the configuration shown in drawing 10 . Moreover, the transmitted power of a transmitting side required to obtain the specified C/N ratio reception output is small, and ends.

[0007] Next, actuation of this high reliance radio set is explained. If abnormalities of operation occur in 1st RA5, it will lapse into the condition of the input signal transmitted from an output terminal 7 deteriorating remarkably, or saying that it is non-receipt. When the input signal from an output terminal 7 is supervised with an indoor arrangement (not shown), and the input signal has deteriorated remarkably there or it is judged that it is non-receipt, a control signal is sent out through the control terminal 17 from an indoor arrangement, and it changes so that both 1st SW3 and 2nd SW6 may be in the condition of a dotted line. At this time, the signal from an antenna 1 is supplied to an output terminal 7 through 2nd RXF14 and 2nd RA15. That is, a signal will be received through 2nd RXF14 and 2nd RA15 which are the reserve system of 1st RXF4 and 1st RA5. Although 2nd RXF14 and 2nd RA15 have composition which is not cooled and there is no improvement effect of the noise figure by cooling as compared with the case of 1st RXF4 and 1st RA5, it becomes possible to avoid the condition of it being able to be cheap, and being able to constitute simply and saying that it is non-receipt.

[0008]

[Problem(s) to be Solved by the Invention] In the conventional high reliance radio set, as the malfunction detection approach of operation when a failure occurs in 1st RA5, the level of the input signal from an output terminal 7 is observed, and there is the approach of judging that actuation is unusual with lowering of the level. However, although the malfunction detection function of operation depending on the level of such an input signal can detect the abnormalities of 1st RA5 of operation by lowering of the level of an input signal by the fixed circuit which for example, a transceiver facility does not move since the level of an input signal is fixed With base station equipments for migration communication modes, such as carrying and a land mobile radiotelephone, since the communications partner was always moving and the received signal level changed a lot, there was a problem that the abnormalities of 1st RA5 of operation were undetectable with lowering of the level of an input signal.

[0009] Moreover, in the conventional high reliance radio set, when it not only cannot carry out direct detection, but a failure generated the failure generated with the cooling means 11 in 1st RA5, there was a problem that there was no means to check whether it functions correctly as whether it is normal and a reserve system, about 2nd RA15 which operates as a reserve system.

[0010] The object of this invention is to offer the high reliance radio set which can supervise actuation of 2nd RA15 which is a reserve system while being able to avoid the condition of becoming non-receipt by changing to a reserve system certainly, when a failure occurs for 1st RA5 or the cooling means 11 of a high reliance radio set.

[0011]

[Means for Solving the Problem]

(1) A 1st signal change means by which the signal from an antenna, an antenna feeder, and its antenna feeder is inputted, and, as for invention of claim 1, is changed by the control signal, The 1st receiving band-pass filter connected to one side of the 1st signal change means, The 1st receiving low noise amplifier connected to the 1st receiving band-pass filter, and the 2nd signal change means which is formed in the output side of the 1st receiving low noise amplifier, and is changed by the control signal, The 2nd receiving band-pass filter connected to the output terminal which outputs the output signal from the 2nd signal change means, and another connection terminal of the 1st signal change means, It has the 2nd receiving low noise amplifier which was connected to the 2nd receiving band-pass filter, and was connected to another connection terminal of the 2nd signal change means. It is enclosed with a thermal shield box, and is cooled by the cooling means, and the 1st receiving band-pass filter and the 1st receiving low noise amplifier are related with the high reliance radio set with which operating power is

supplied to the 1st receiving low noise amplifier, a cooling means, and the 2nd receiving low noise amplifier through the 1st, 2nd, and 3rd power supply terminals, respectively.

[0012] A pilot signal generation means to generate the pilot signal which has a frequency in the attenuation band of the 1st and 2nd receiving band-pass filter in claim 1, The 1st pilot signal impregnation means inserted in the path between the 1st receiving band-pass filter and the 1st receiving low noise amplifier, The 2nd pilot signal impregnation means inserted in the path between the 2nd receiving band-pass filter and the above-mentioned 2nd receiving low noise amplifier, It is between the output side of the 1st receiving low noise amplifier, and the 2nd signal change means, and the 1st distribution means inserted in the outside of a thermal shield box, and the output side of the 2nd receiving low noise amplifier and the 2nd distribution means inserted between the 2nd signal change means are established.

[0013] Moreover, a 1st level detection means to detect the level of a pilot signal from the signal distributed from the 1st distribution means, A 2nd level detection means to detect the level of a pilot signal from the signal distributed from the 2nd distribution means, The level of the pilot signal detected by the 1st level detection means is compared with the threshold set up beforehand. When the level of a pilot signal is lower than a threshold, while changing the 1st and 2nd signal change means, the 1st alarm signal is sent out. The control means which compares the level and the threshold of a pilot signal which were detected by the 2nd level detection means, and sends out the 2nd alarm signal when the level of a pilot signal is lower than a threshold, The manual change means which changes the 1st and 2nd signal change means manually into the above-mentioned control means is established.

[0014] The 1st receiving band-pass filter consists of superconducting materials, and is made into the superconducting state by the cooling means.

(2) In invention of claim 2, in the above (1), prepare a common power supply terminal instead of the 1st and 3rd power supply terminals, and a power distribution means distributes the power supplied from the common power supply terminal, and supply the 1st and 2nd receiving low noise amplifier.

[0015] (3) In invention of claim 3, delete the 2nd power supply terminal of the above (2), and supply operating power also to a cooling means from the above-mentioned power distribution means.

(4) In invention of claim 4, in the above (1), the 1st and 3rd power supply terminals are deleted, it is inserted between the 2nd signal change means and an output terminal, and a power stabilization means stabilizes the power separated with the power separation filter which separates the operating power supplied through the output terminal from the input signal of a RF, and its power separation filter, and supply the 1st and 2nd receiving low noise amplifier is established.

[0016] (5) In invention of claim 5, in the above (4), the 2nd power supply terminal is deleted and supply operating power also to a cooling means from a power stabilization means.

(6) In invention of claim 6, set they to be [any / the above (1) thru/or / of (5)], and establish a temperature detection means to detect the temperature in a thermal shield box, and acquire the temperature information in a thermal shield box from a temperature detection means, and a control means sends out the 3rd alarm signal while changing the 1st and 2nd signal change means, when it is beyond the temperature as which the temperature information was determined beforehand.

[0017] (7) In invention of claim 7, a temperature detection means detects the temperature of the cooling member of the 1st receiving band-pass filter in a thermal shield box, the 1st receiving low noise amplifier, or a cooling means in the above (6).

(8) In invention of claim 8, while setting they to be [any / the above (1) thru/or / of (7)] and establishing a common level detection means instead of the 1st and 2nd level detection means, a 3rd signal change means to change the signal from the 1st and 2nd distribution means, and to supply a common level detection means is established.

[0018] (9) It sets they to be [any / the above (1) thru/or / of (7)], and a superconducting material is constituted from invention of claim 9 by the high-temperature superconductor.

(10) In invention of claim 10, it sets they to be [any / the above (1) thru/or / of (7)], an antenna feeder is omitted, and an antenna is directly linked with an equipment case.

[0019]

[Embodiment of the Invention] The sign same into the part corresponding to drawing 1 for the example of invention of claim 1 is attached with drawing 10, and it is shown. In this example, a pilot signal generation means 21 to generate the pilot signal of the attenuation band of 1st RXF4 and 2nd RXF14 within the limits is formed in the outside of the thermal shield box 10, and the 1st pilot signal impregnation means 22 and the 2nd pilot signal impregnation means 23 of pouring in the pilot signal generated with the pilot signal generation means 21, respectively between 1st RXF4 and 1st RA5 and between 1st RXF14 and 2nd RA15 are established. Moreover, the 1st distribution means 24 is established between 1st RA5 and 2nd SW6, and the 2nd distribution means 25 is established between 2nd RA15 and 2nd SW6. Furthermore, the 1st level detection means 26 and the 2nd level detection means 27 of detecting the level of a pilot signal, respectively from the signal distributed with the 1st distribution means 24 and the 2nd distribution means 25 are established.

[0020] The output signal of the 1st level detection means 26 and the 2nd level detection means 27 is inputted into a control means 28. Furthermore, the manual change means 29 which changes 1st SW3 and 2nd SW6 manually is formed in this control means 28. The pilot signal generation means 21, the 1st distribution means 24, the 2nd distribution means 25, the 1st level detection means 26, the 2nd level detection means 27, and a control means 28 are contained by one case 18.

[0021] 1st RXF4 consists of superconducting materials, and it differs from drawing 10 in that the superconducting material is made into the superconducting state by cooling by the cooling means 11. The 1st level detection means 26 and the 2nd level detection means 27 can use a selection level meter etc. [whether a control means 28 consists of a reference voltage generating means to generate the threshold electrical potential difference set up beforehand, a comparator, etc., and] Or it is constituted by the microprocessor as a basic circuit, an A/D converter, ROM and RAM, the D/A converter, etc., and also sets in which configuration. Supervising the signal from the 1st level detection means 26 and the 2nd level detection means 27, as compared with the threshold set up beforehand, in being lower than a threshold, it changes 1st SW3 and 2nd SW6, or/and it has the function which sends out a predetermined alarm signal.

[0022] Since both the grand layers and signal lines that 1st RXF4 consists of microstrip lines, and constitute the microstrip line consist of superconducting materials and these are made the superconducting state by cooling by the cooling means 11, the thermal noise generated in 1st RXF4 is remarkably small, therefore the noise figure of a receiver is improved.

[0023] Next, actuation of this example is explained. The pilot signal generated with the pilot signal generation means 21 is poured in by the 1st pilot signal impregnation means 22. Since it is set up at this time so that the frequency of a pilot signal may become the attenuation band of 1st RXF4, the poured-in pilot signal is reflected by 1st RXF4, and since it is inputted into 1st RA5, there is no fear of a pilot signal not being emitted from an antenna 1 and doing active jamming to an alien system. After the input signal to which the pilot signal was added is amplified by 1st RA5, it is distributed by the 1st distribution means 24, and the level of the poured-in pilot signal is detected in the 1st level detection means 26. The level of this detected pilot signal is supervised by the control means 28, and when lower than the threshold set up beforehand, while 1st SW3 and 2nd SW6 are changed from the location of a continuous line to the location of a dotted line, respectively, the 1st alarm signal showing the failure having occurred is outputted to the system of 1st RA5 through a terminal 30.

[0024] On the other hand, after a pilot signal is poured in by the 2nd pilot signal impregnation means 23 as well as the 1st pilot signal impregnation means and being amplified by 2nd RA15, it is distributed by the 2nd distribution means 25 and the level of the poured-in pilot signal is detected also in the 2nd level detection means 27. The level of this detected pilot signal is supervised by the control means 28, and when lower than the threshold set up beforehand, the 2nd alarm signal showing the failure having occurred is outputted to the system of 2nd RA15 through a terminal 30.

[0025] Moreover, it is collectively formed in the control means 28 by the manual change means 29 so that 1st SW3 and 2nd SW6 can be changed manually, and when a maintenance man operates this manual change means 29 at the time of maintenance and inspection, it also has composition changed to the path of 2nd RXF14 which is a reserve system manually, and 2nd RA15. As mentioned above, by

comparing the level of a pilot signal with the threshold set up beforehand, using the independent pilot signal, an input signal can send out the alarm signal showing failure generating while being able to detect certainly the abnormalities of 1st RA5 and 2nd RA15 of operation. Consequently, since it changes to a reserve system a control means 28 or when a maintenance man operates the manual change means 29, the condition of saying that it is non-receipt again also at the time of maintenance and inspection also at the time of the abnormalities of 1st RA5 of operation is avoidable.

[0026] in addition, drawing 1 -- although the example which does not cool the 1st pilot signal impregnation means 22 with the cooling means 11 is indicated if it is, it is good also as a configuration which cools the 1st pilot signal impregnation means 22 with the cooling means 11. As shown in drawing 2, you may make it supply operating power to each of 1st RA5 and 2nd RA15 through common power supply terminal 12' and the power distribution means 31 (claim 2), and a power supply terminal can be reduced in this case.

[0027] As shown in drawing 3, you may make it supply operating power to each of the cooling means 11 other than 1st RA5 and 2nd RA15 further through common power supply terminal 12' and the power distribution means 31 (claim 3), and a power supply terminal can be further reduced in this case. As shown in drawing 4, an antenna 1 may be directly linked with a case 18, without minding the antenna feeder 2 (claim 10). Thus, since a lost part of the antenna feeder 2 can be reduced by removing the antenna feeder 2 and the noise figure of the whole receiver can be improved as a result, receiving sensibility is improved further. Although drawing 4 is carried out based on the example of drawing 1, of course, it is applicable also to the example of drawing 2 and drawing 3.

[0028] Drawing 5 shows the example of the high reliance radio set by invention of claim 4. In this invention, as compared with the example of drawing 1, it replaces with the 1st power supply terminal 12 and the 3rd power supply terminal 16, and it is between 2nd SW6 and an output terminal 7, and it differs that the power separation filter 41 is formed in the interior of a case 18 from the point that a power stabilization means 42 to stabilize the output power of the power separation filter 41 is formed in the outside of the thermal shield box 10.

[0029] The approach of superimposing a direct current or low frequency current on an input signal, and sending out from indoor as an approach of supplying power to 1st RA5 and 2nd RA15, i.e., the phantom feed approach, can be used. Said transmission line is supplied to the place in which the indoor input-signal recovery means etc. is formed through the transmission line (not shown) with which this example was connected to the output terminal 7 by the case where phantom feed is made as the feed approach to 1st RA5 and 2nd RA15 to a direct current or low frequency current from through and an output terminal 7 to the power separation filter 41. The power separation filter 41 consists of easy splitters which separate an input signal, a direct current, or low frequency current. Moreover, the power stabilization means 42 is a means to output a direct current of a predetermined electrical potential difference to stability while stabilizing the direct current or low frequency current separated with the power separation filter 41, and a DC-DC converter, switching power supply, etc. can constitute it. There is an advantage that a high reliance radio set can be constituted from doing in this way, reducing the power cable from indoor and. In addition, as shown in drawing 4, the antenna feeder 2 may be removed for this example, and you may apply to the configuration which linked the antenna 1 with the case 18 directly.

[0030] As shown in drawing 6, you may make it supply operating power to the cooling means 11 further through the power stabilization means 42 (claim 5), and a power supply terminal can be further reduced in this case. Of course, as shown in drawing 4, the antenna feeder 2 may be removed for this example, and you may apply to the configuration which linked the antenna 1 with the case 18 directly. Drawing 7 shows the example of the high reliance radio set of invention by claim 6. It differs in that a temperature detection means 51 by which this example measures the temperature inside the thermal shield box 10 as compared with the example of drawing 1 is formed in the interior of the thermal shield box 10.

[0031] A control means 28 supervising not only the disregard level from the 1st level detection means 26 and the 2nd level detection means 27 but the temperature inside the thermal shield box 10 detected with the temperature detection means 51 Also when the signal from a temperature detection means

becomes higher than the threshold set up beforehand, while changing both the 1st SW and 2nd SW6 from a continuous line to the location of a dotted line, it has the composition that the 3rd alarm signal showing the cooling failure having occurred is sent out through a terminal 30.

[0032] While being able to avoid the condition of saying that it is non-receipt since it changes to a spare receiving system also when the temperature information in the thermal shield box 10 is acquired and this becomes by taking the above configurations beyond a predetermined value, the alarm signal showing failure generating can be sent out. In addition, although carried out based on the example of a configuration of drawing 1 in drawing 7, the same effectiveness is acquired even if it carries out based on the example of a configuration shown in drawing 2 thru/or drawing 6.

[0033] Drawing 8 shows the example of the high reliance radio set of invention by claim 7. In this example, it differs as compared with the example of drawing 7 in that drawing 8 (C) of 1st RA5 carries out [drawing 8 (A)] direct detection of the temperature of cooling member 11a, respectively in drawing 8 (B) of 1st RXF4. The temperature failure generated in 1st RXF4, 1st RA5, or cooling member 11a which is an object for cooling is more detectable to accuracy by taking such a configuration.

[0034] As shown in drawing 9, the 3rd signal change means (SW) 61 changed by the control means 28 may be established, and common level detection means 26' may detect the level of a pilot signal (claim 8). In this case, a level detection means is further reducible. In addition, although carried out based on the example of drawing 1 in drawing 9, the same effectiveness is acquired also in the example of a configuration shown in drawing 2 thru/or drawing 8.

[0035] Moreover, although not illustrated, in case 1st RXF4 is constituted, the ingredient which contains a high-temperature superconductor in a component as a superconducting material can be used (claim 9). As a high-temperature superconductor, there is a superconductor which contains a copper acid ghost in a component, for example. There are some high-temperature superconductors to which the critical temperature with which a superconducting state is attained exceeds 100K, and in such a superconductor, since a superconducting state is acquired only by cooling about [of liquid nitrogen], for example to boiling point 77.4K, while being able to ease the refrigeration capacity of the cooling means 11, a cheap very-low-temperature refrigerator becomes usable smaller. Consequently, a high reliance radio set can be constituted small and cheaply.

[0036]

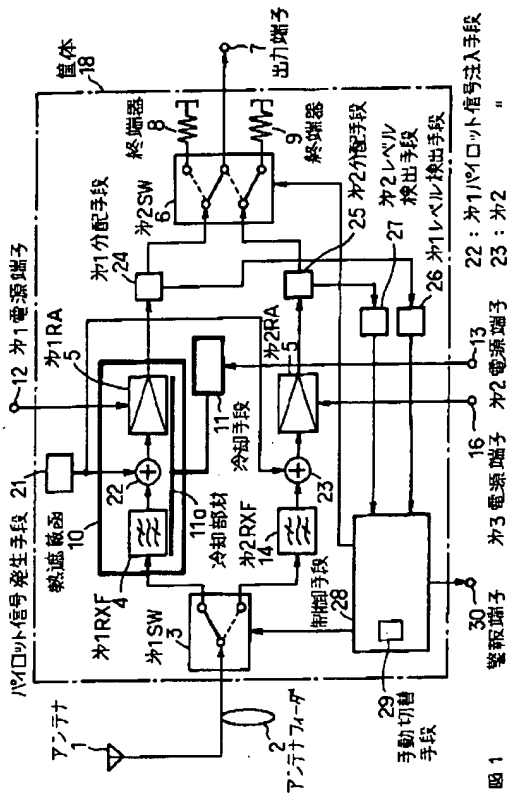
[Effect of the Invention]

** As stated above, in this invention, by always inputting a pilot signal into 1st RA5, and supervising that output level, the failure of 1st RA5 can be detected and it can change to a reserve system.

** The temperature detection means 15 is established in a thermal shield box, and by carrying out a temperature monitor, the failure of the cooling means 11 can be detected and it can change to a reserve system again.

[0037] ** Reliable maintenance can be performed by inputting a pilot signal into 2nd RA15 of a reserve system, monitoring the output level continuously and detecting whether it is normal.

[Translation done.]

Drawing selection Representative drawing

[Translation done.]